REMARKS

Claims 1-3, 5-10, 13, 16, 18-28, 31, 34, 36-43, 45, 48, and 50-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsu, *et al.* (U.S. Patent Number 6,461,955) in view of Jiang, *et al.* (U.S. Patent Number 6,461,955), Aoi (U.S. Patent Number 6,387,824) and Lee, *et al.* (U.S. Patent Number 6,171,951). Claims 17, 35 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsu, *et al.* in view of Jiang, *et al.*, Aoi, and Lee, *et al.* and further in view of Robinson, *et al.* (U.S. Patent Number 4,201,579). Claims 11-12, 14-15, 29-30, 32-33, 44 and 46-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsu, *et al.* in view of Jiang, *et al.*, Aoi and Lee, *et al.*, and further in view of Lui (U.S. Patent Number 6,391,761). In view of the amendments to the claims and the following remarks, the rejections are respectfully traversed, and reconsideration of the rejections is requested.

In the present invention of claims 1-3 and 5-20, a method of fabricating dual damascene interconnections includes forming a organo silicate glass layer on a substrate, and forming a via in the organo silicate glass layer. The via is filled with a carbon-free inorganic filler, the inorganic filler extending laterally beyond top edges of the via. The method further includes forming a photoresist pattern on the inorganic filler to define a trench. After forming the photoresist pattern, the inorganic filler filling the via and extending laterally beyond the top edges of the via and the organo silicate glass layer are partially etched to form the trench.

Claim 1 is amended to clarify certain features of the invention. Specifically, the claims are amended to clarify that the method of fabricating dual damascene interconnections includes, after forming the photoresist pattern on the inorganic filler filling the via and extending laterally beyond the top edges of the via to define a trench, partially etching the inorganic filler filling the via and extending laterally beyond the top edges of the via and the organo silicate glass layer to form the trench. It is believed that these amendments to the claims clarify the distinctions between the claimed invention and the cited references.

In the present invention of claims 21-38, a method of fabricating dual damascene interconnections includes forming an organo silicate glass layer on a substrate, and forming a via in the organo silicate glass layer. The via is filled with an HSQ-based filler, the HSQ-based filler

extending laterally beyond top edges of the via. A photoresist pattern is formed on the HSQ-based filler filling the via and extending laterally beyond the top edges of the via to define a trench. After forming the photoresist pattern, the HSQ-based filler filling the via and extending laterally beyond the top edges of the via and the organo silicate glass layer are partially etched to form the trench.

Claim 21 is amended to clarify certain features of the invention. Specifically, the claims are amended to clarify that the method of fabricating dual damascene interconnections includes after forming the photoresist pattern on the HSQ-based filler filling the via and extending laterally beyond the top edges of the via to define the trench, partially etching the HSQ-based filler filling the via and extending laterally beyond the top edges of the via and the organo silicate glass layer to form the trench. It is believed that these amendments to the claims clarify the distinctions between the claimed invention and the cited references.

In the present invention of claims 39-52, a method of fabricating dual damascene interconnections includes forming a lower interconnection on a substrate and forming an etch stop on the lower interconnection. The method further includes forming an organo silicate glass layer on the etch stop layer and forming a via through the organo silicate glass layer to expose the etch stop. The via is filled with an HSQ-based filler, which fills the via and extends laterally beyond top edges of the via. The surface of the HSQ-based layer is processed using plasma, and an anti-reflection layer is formed on the plasma-processed surface of the HSQ-based filler. In addition, the method includes forming a photoresist pattern on the anti-reflective layer to define a trench. After forming the photoresist pattern, the anti-reflective layer, the HSQ-based filler filling the via and extending laterally beyond the top edges of the via, and the organo silicate glass layer are partially etched to form the trench.

Claim 39 is amended to clarify certain features of the invention. Specifically, the claims are amended to clarify that the method of fabricating dual damascene interconnections includes after forming the photoresist pattern on the anti-reflective layer to define the trench, partially etching the anti-reflective layer, the HSQ-based filler filling the via and extending laterally beyond the top edges of the via and the organo silicate glass layer to form the trench. It is

believed that these amendments to the claims clarify the distinctions between the claimed invention and the cited references.

Tsu, *et al.* discloses depositing a via protect layer 114 to fill a via through an IMD 108 and ILD 106 layer. With reference to FIG. 2C of Tsu, *et al.*, after depositing the via protect layer 114, the via protect layer 114 is selectively etched back, such that the via protect layer does not extend across the via hole. A trench pattern 120 is then formed on a hardmask layer 110 on the surface of the IMD layer 108, and the IMD layer 108 and the via protect layer 114 filling the via are etched.

Tsu, *et al.* fail to teach or suggest that a method of fabricating dual damascene interconnections includes, after forming a photoresist pattern on an inorganic filler filling a via and extending laterally beyond top edges of the via to define a trench, partially etching the inorganic filler filling the via and extending laterally beyond top edges of the via and a organo silicate glass layer to form the trench, as claimed in claims 1-3 and 5-20. Instead, in Tsu, *et al.* the via protect layer 114 is partially etched before the trench pattern 120 is formed, and the trench pattern 120 is formed on the surface of a hardmask layer 110 which is formed on the surface of the IMD layer 108.

Tsu, *et al.* fail to teach or suggest that a method of fabricating dual damascene interconnections includes, after forming a photoresist pattern on an HSQ-based filler filling a via and extending laterally beyond top edges of the via to define a trench, partially etching the HSQ-based filler filling the via and extending laterally beyond the top edges of the via and an organo silicate glass layer to form the trench, as claimed in claims 21-38. Instead, in Tsu, *et al.* the via protect layer 114 is partially etched before the trench pattern 120 is formed, and the trench pattern 120 is formed on the surface of a hardmask layer 110 which is formed on the surface of the IMD layer 108.

Tsu, *et al.* fail to teach or suggest that a method of fabricating dual damascene interconnections includes, after forming a photoresist pattern on a anti-reflective layer to define a trench, partially etching the anti-reflective layer, an HSQ-based filler filling a via and extending laterally beyond top edges of the via and an organo silicate glass layer to form the trench, as

claimed in claims 39-52. Instead, in Tsu, *et al.* the via protect layer 114 is partially etched before the trench pattern 120 is formed, and the trench pattern 120 is formed on the surface of a hardmask layer 110 which is formed on the surface of the IMD layer 108.

Jiang, *et al.* is cited in the Office Action as disclosing a method of forming a dual damascene using organo silicate glass having a dielectric constant of 3.3 or less.

Jiang, *et al.* fails to teach or suggest that a method of fabricating dual damascene interconnections includes, after forming a photoresist pattern on an inorganic filler filling a via and extending laterally beyond top edges of the via to define a trench, partially etching the inorganic filler filling the via and extending laterally beyond the top edges the via and a organo silicate glass layer to form the trench, as claimed in claims 1-3 and 5-20.

Jiang, *et al.* fails to teach or suggest that a method of fabricating dual damascene interconnections includes, after forming a photoresist pattern on an HSQ-based filler filling a via and extending laterally beyond top edges of the via to define a trench, partially etching the HSQ-based filler filling a via and extending laterally beyond top edges of the via and an organo silicate glass layer to form the trench, as claimed in claims 21-38.

Jiang, *et al.* fails to teach or suggest that a method of fabricating dual damascene interconnections includes, after forming a photoresist pattern on an anti-reflective layer to define a trench, partially etching the anti-reflective layer, an HSQ-based filler filling a via and extending laterally beyond top edges of the via and an organo silicate glass layer to form the trench, as claimed in claims 39-52.

Aoi discloses a resist pattern 12 formed having an opening over a region of an organic-inorganic hybrid film 11 to be used as a mask to form a wire groove or contact hole in the organic-inorganic hybrid film 11.

Aoi fails to teach or suggest that a method of fabricating dual damascene interconnections includes, after forming a photoresist pattern on an inorganic filler filling a via and extending laterally beyond top edges of the via to define a trench, partially etching the inorganic filler filling the via and extending laterally beyond the top edges the via and a organo silicate glass layer to form the trench, as claimed in claims 1-3 and 5-20.

Aoi fails to teach or suggest that a method of fabricating dual damascene interconnections includes, after forming a photoresist pattern on an HSQ-based filler filling a via and extending laterally beyond top edges of the via to define a trench, partially etching the HSQ-based filler filling a via and extending laterally beyond top edges of the via and an organo silicate glass layer to form the trench, as claimed in claims 21-38.

Aoi fails to teach or suggest that a method of fabricating dual damascene interconnections includes, after forming a photoresist pattern on an anti-reflective layer to define a trench, partially etching the anti-reflective layer, an HSQ-based filler filling a via and extending laterally beyond top edges of the via and an organo silicate glass layer to form the trench, as claimed in claims 39-52.

Lee, *et al.* is cited in the Office Action as disclosing plasma treating a low k dielectric layer.

Lee, *et al.* fail to teach or suggest a method of fabricating dual damascene interconnections that includes, after forming a photoresist pattern on an inorganic filler filling a via and extending laterally beyond top edges of the via to define a trench, partially etching the inorganic filler filling the via and extending laterally beyond top edges of the via and a organo silicate glass layer to form the trench, as claimed in claims 1-3 and 5-20. In addition, Lee, *et al.* fail to teach or suggest a method of fabricating dual damascene interconnections that includes, after forming a photoresist pattern on an HSQ-based filler filling a via and extending laterally beyond top edges of the via to define a trench, partially etching the HSQ-based filler filling the via and extending laterally beyond top edges of the via and an organo silicate glass layer to form the trench, as claimed in claims 21-38. In addition, Lee, *et al.* fail to teach or suggest a method of fabricating dual damascene interconnections that includes, after forming a photoresist pattern on an anti-reflective layer to define a trench, partially etching the anti-reflective layer, an HSQ-based filler filling a via and extending laterally beyond top edges of the via and an organo silicate glass layer to form the trench, as claimed in claims 39-52.

Tsu, *et al.*, Jiang, *et al.*, Aoi and Lee, *et al.* fail to teach or suggest these elements of the invention set forth in claims 1-3 and 5-20, 21-28, and 39-52. Accordingly, there is no

combination of the references which would provide such teaching or suggestion. None of the references, taken alone or in combination, teaches or suggests the invention set forth in claims 1-3, 5-20, 21-28, and 39-52. Therefore, it is believed that the claims 1-3, 5-20, 21-28, and 39-52. are allowable over the cited references, and reconsideration of the rejections of claims 1-3, 5-10, 13, 16, 18-28, 31, 34, 36-43, 45, 48, and 50-52 under 35 U.S.C. § 103(a) based on Tsu, *et al.*, Jiang, *et al.*, Aoi and Lee, *et al.*, is respectfully requested.

Robinson, *et al.* is cited in the Office Action as disclosing the use of H2-based plasma to remove photoresist. Robinson, *et al.* fail to teach or suggest a method of fabricating dual damascene interconnections that includes, after forming a photoresist pattern on an inorganic filler filling a via and extending laterally beyond top edges of the via to define a trench, partially etching the inorganic filler filling the via and extending laterally beyond top edges of the via and a organo silicate glass layer to form the trench, as claimed in claims 1-3 and 5-20. In addition, Robinson, *et al.* fail to teach or suggest a method of fabricating dual damascene interconnections that includes, after forming a photoresist pattern on an HSQ-based filler filling a via and extending laterally beyond top edges of the via to define a trench, partially etching the HSQ-based filler filling the via and extending laterally beyond the top edges of the via and an organo silicate glass layer to form the trench, as claimed in claims 21-38. Robinson, *et al.* fail to teach or suggest a method of fabricating dual damascene interconnections that includes, after forming a photoresist pattern on an anti-reflective layer to define a trench, partially etching the anti-reflective layer, an HSQ-based filler filling a via and extending laterally beyond top edges of the via and an organo silicate glass layer to form the trench, as claimed in claims 39-52.

Robinson, *et al.*, like Tsu, *et al.*, Jiang, *et al.*, Aoi and Lee, *et al.*, fails to teach or suggest these elements of the invention set forth in claims 1-3 and 5-20, 21-28, and 39-52. Accordingly, there is no combination of the references which would provide such teaching or suggestion. None of the references, taken alone or in combination, teaches or suggests the invention set forth in claims 1-3, 5-20, 21-28, and 39-52. Therefore, it is believed that the claims 1-3, 5-20, 21-28, and 39-52. are allowable over the cited references, and reconsideration of the rejections of claims

17, 35 and 49 under 35 U.S.C. § 103(a) based on Tsu, *et al.*, Jiang, *et al.*, Aoi, Lee, *et al.*, and Robinson, *et al.*, is respectfully requested.

Lui is cited in the Office Action as disclosing the use of an organic anti-reflective layer 85. Lui fails to teach or suggest a method of fabricating dual damascene interconnections that includes, after forming a photoresist pattern on an inorganic filler filling a via and extending laterally beyond top edges of the via to define a trench, partially etching the inorganic filler filling the via and extending laterally beyond the top edges of the via and a organo silicate glass layer to form the trench, as claimed in claims 1-3 and 5-20. In addition, Lui fails to teach or suggest a method of fabricating dual damascene interconnections that includes, after forming a photoresist pattern on an HSQ-based filler filling a via and extending laterally beyond top edges of the via to define a trench, partially etching the HSQ-based filler filling the via and extending laterally beyond top edges of the via and an organo silicate glass layer to form the trench, as claimed in claims 21-38. In addition, Lui fails to teach or suggest a method of fabricating dual damascene interconnections that includes, after forming the photoresist pattern on the anti-reflective layer to define the trench, partially etching the anti-reflective layer, an HSQ-based filler filling a via and extending laterally beyond top edges of the via and the organo silicate glass layer to form the trench, as claimed in claims 39-52.

Lui, like Tsu, *et al.*, Jiang, *et al.*, Aoi and Lee, *et al.*, fails to teach or suggest these elements of the invention set forth in claims 1-3 and 5-20, 21-28, and 39-52. Accordingly, there is no combination of the references which would provide such teaching or suggestion. None of the references, taken alone or in combination, teaches or suggests the invention set forth in claims 1-3 and 5-20, 21-28, and 39-52. Therefore, it is believed that the claims 1-3, 5-20, 21-28, and 39-52. are allowable over the cited references, and reconsideration of the rejections of claims 11-12, 14-15, 29-30, 32-33, 44 and 46-47 under 35 U.S.C. § 103(a) based on Tsu, *et al.*, Jiang, *et al.*, Aoi, Lee, *et al.*, and Lui, is respectfully requested.

In view of the amendments to the claims and the foregoing remarks, it is believed that all claims pending in the application are in condition for allowance, and such allowance is respectfully solicited. If a telephone conference will expedite prosecution of the application, the Examiner is invited to telephone the undersigned.

Respectfully submitted,

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Mills & Onello, LLP
Eleven Beacon Street, Suite 605
Boston, MA 02108
Telephone: (617) 994-4900
Facsimile: (617) 742-7774
J:\SAM\0313CIP\amendc\amendmentc.wpd

Steven M. Mills
Registration Number 36,610
Attorney for Applicants